PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Form PCT/IPEA/416
P200301955 WO		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/DK2004/000837	01.12.2004	01.12.2003

International Patent Classification (IPC) or national classification and IPC
INV. H02M3/07 H04R1/04 H04R3/00 H04R19/00

Applicant
AUDIOASICS A/S et al.

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *sent to the applicant and to the International Bureau)* a total of 1-5 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in celectronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
30.09.2005	29.03.2006
Name and mailing address of the international preliminary examining authority:	Authorized officer
European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Moscu, V Telephone No. +31 70 340-2034

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/DK2004/000837

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
   - ☐ international search (under Rules 12.3 and 23.1(b))
   - ☐ publication of the international application (under Rule 12.4)
   - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-39 as originally filed

Claims, Numbers

1-26 received on 30.09.2005 with letter of 30.09.2005

Drawings, Sheets

1-14 as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/DK2004/000837

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-26
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-26
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-26
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V.

1. The following document is referred to in this communication:

   D1: US-A-5 490 220 (LOEPPERT ET AL) 6 February 1996 (1996-02-06)

2 Considering that the deletion of the feature mentioned on point 6 it will be overcame, it appears that the subject-matter of claim 1 is new and inventive over disclosure of the prior art documents cited in the search report.

2.1 None of the documents is disclosing an integrated circuit to provide a microphone output signal comprising a voltage pump with two stages wherein the second stage components have a breakdown voltage level above the breakdown voltage level of the first stage components.

Therefore the present application appears to be new (Article 33(2) PCT) over the cited prior art.

2.2 The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows an integrated circuit to provide a microphone output signal comprising a voltage pump. However it is not suggested to the skilled person that the voltage pump can be divided in stages with different breakdown voltage levels of the components in such a way that the first stage is working to a nominal voltage level and the second stage is comprising different components special designed so to resist to voltage levels higher than the nominal voltage level.

Therefore the present application appears to involve an inventive step (Article 33(3) PCT) over the cited prior art.

3 Claims 2-26 are dependent on claim 1 and as such appear to meet the requirements of the PCT with respect to novelty and inventive step.

5 The subject-matter of claims 1-26 appears to be industrially applicable (Article 33(4) PCT) since it can be used in microphones manufacturing industry.

6 The amendments filed under Article 19(1) introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 19(2) PCT.
The apparatus disclosed in newly filed claim 1 is comprising " a first pump stage at which an oscillator provides oscillating signals with pulse amplitudes". However nowhere in the description or drawings is disclosed such a voltage pump to be used to bias a microphone comprising a first pump stage and a second pump stage, wherein the first pump stage is comprising only an oscillator. Instead the first pump stage is comprising an oscillator providing an oscillating signal with a voltage pulse level and this oscillating signal **is pumped to a higher voltage pulse level** (Fig. 8 Ref 802).

The description Page 14, Lines 5-11 and Figure 1 could not be considered to support the omission of the feature that the oscillating signal is pumped to a higher voltage pulse level inside the first stage. Here it is disclosed just a general voltage pump comprising an oscillator and a pumping stage but not an arrangement made from two stages at which the second stage components have a breakdown level above the breakdown level of the first stage components. So it can not be considered that the first stage is disclosed, ever, as comprising only a oscillator providing oscillating signals with pulse amplitudes.

In effect the deletion of this feature introduces subject-matter which extends beyond the content of the application as filed, contrary to Article 19(2)/Article 34(2)(b) PCT.

CLAIMS

1. An integrated circuit configured to provide a microphone output signal, comprising:

a preamplifier coupled to receive an input signal, generated by a first microphone member that is movable relative to a second microphone member; and

a voltage pump to provide a bias voltage to either microphone member, CHARACTERIZED IN THAT

the voltage pump has a first pump stage at which an oscillator provides oscillating signals with pulse amplitudes, and where the voltage pump has a second pump stage at which a voltage level is pumped to a higher level by means of a circuit operating on the oscillator signal, provided at the first stage;

the first pump stage is configured with first components with a nominal voltage level above which the components have a voltage breakdown level, and

the second pump stage is configured with second components which have a voltage breakdown level above the voltage breakdown level of the first components; and

the pulse amplitudes of the oscillating signals provided at the first pump stage are substantially equal to the nominal voltage level.

2. An integrated circuit according to claim 1, where the oscillator is configured to draw substantially equal levels of current across signal cycles provided by the oscillator.

3. An integrated circuit according to claim 1 or 2, where the oscillator comprises paths with elements that can be charged with an electrical charge and where the paths are controlled by the oscillator to charge the different

elements of the different paths alternately by a current drawn from a common source.

4. An integrated circuit according to any of claims 1 to 3, where the first pump stage is configured with a voltage pump which receives the oscillating signal, with a voltage pulse level, and provides a pumped oscillating signal, with a higher voltage pulse level, which is supplied to the second pump stage.

5. An integrated circuit according to any of claims 1 to 4, where an output signal of the first voltage pump stage is provided as a feedback signal to a circuit which maintains a fixed voltage pulse level of the signals output from the first pump stage (P1'; P2').

6. An integrated circuit according to any of claims 1 to 5, where the second pump stage comprises a voltage pump configured as a Dickson converter.

7. An integrated circuit according to any of claims 1 to 6, where an output signal of a voltage converter, of the Dickson type, is provided as a feedback signal to a circuit which provides a regulated voltage pulse level of the signals output from the voltage converter.

8. An integrated circuit according to any of claims 1 to 7, where multiple voltage converters are cascaded to provide the bias voltage, and where a further voltage converter, which matches the first converter in the cascade, is coupled to receive the same signal as the first converter and to provide a feedback signal to a circuit which maintains a fixed voltage level of the signals output from the further voltage converter.

9. An integrated circuit according to any of claims 1 to 8, where the voltage pump comprises capacitors implemented as Metal capacitors.

10. An integrated circuit according to any of claims 1 to 9, where the voltage pump comprises diodes implemented as Poly-diodes.

11. An integrated circuit according to any of claims 1 to 10, where the voltage pump comprises diodes implemented as diffusion diodes in an N-well.

12. An integrated circuit according to any of claims 1 to 11, where the preamplifier, comprises

a differential input stage with a first and a second input terminal and an output stage with an output terminal;

a feedback circuit, with a low-pass frequency transfer function, coupled between the output terminal and the first input terminal and integrated on the semiconductor substrate; and

where the second input terminal provides an input for a microphone signal.

13. An integrated circuit according to claim 12, where the feedback circuit is a filter with a transfer function, in the frequency domain, with a zero and a pole; wherein the zero is located at a higher frequency than the pole.

14. An integrated circuit according to claim 12 or 13 where the preamplifier has a transfer function, in the frequency domain, with a zero and a pole; wherein the pole is located in the range 0.1Hz to 50 Hz or 0.1Hz to 100Hz or 0.1 to 200Hz.

15. An integrated circuit according to any of claims 12 to 14, where the feedback circuit is a filter which, in the frequency domain, has a relatively high gain level below a transition frequency range and a relatively low gain level above the transition frequency range.

16. An integrated circuit according to any of claims 12 to 15, where the transition frequency range is located below a frequency of about 100 Hz.

17. An integrated circuit according to any of claims 12 to 16, where the transition frequency range is located below a frequency of 40 Hz.

18. An integrated circuit according to any of claims 1 to 17, comprising a DC blocking capacitor coupled to diminish a DC voltage at the input of the preamplifier, which DC voltage originates from biasing the first or second microphone member.

19. An integrated circuit according to any of claims 1 to 18, where the integrated circuit comprises an A/D converter.

20. An integrated circuit according to any of claims 1 to 19, where the integrated circuit further is configured with an analogue-to-digital converter; and wherein the voltage pump and the analogue-to-digital converter are driven by a common clock-signal.

21. An integrated circuit according to claim 20 or 21, where the analogue-to-digital converter is of the sigma delta converter type.

22. An integrated circuit according to any of claims 1 to 21, comprising a high-pass filter.

23. An integrated circuit according to any of claims 1 to 22, where the preamplifier is configured to provide a high-pass filter function.

24. A microphone comprising an integrated circuit according to any of the claims 1 to 23.

25. A microphone according to claim 24, where the microphone is a condenser microphone.

26. A microphone according to claim 24, where the microphone is a MEMS microphone.